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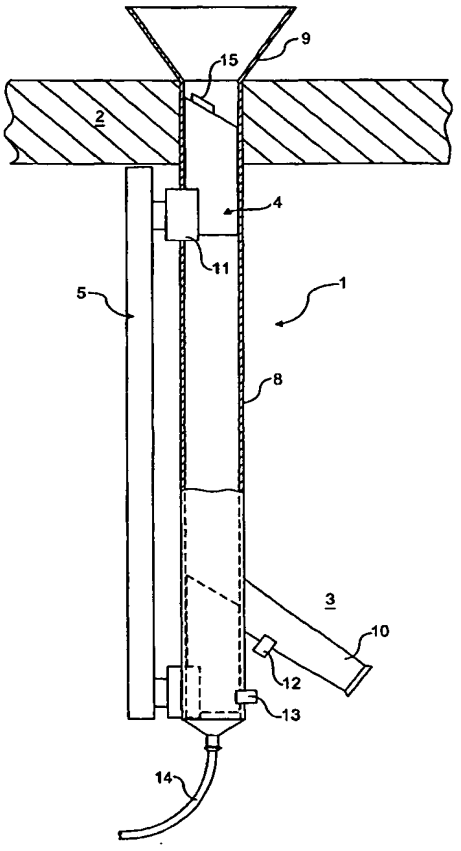
(54) Title: APPARATUS FOR TRANSFERRING FLOWABLE MATERIAL



(57) Abstract: The invention relates to apparatus (1) for transferring flowable particulate material such as dry tablets (not shown) for example pharmaceutical tablets, from one station (2) to another (3). The apparatus (1) comprises a carrier (4) for the tablets, and means (5) externally of the carrier (4) for moving the carrier (4) between stations (2) and (3), the arrangement being such that the carrier (4) and the means (5) are not connected mechanically for movement of the carrier (4).

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Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

Published:

— *with international search report*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

APPARATUS FOR TRANSFERRING FLOWABLE MATERIAL

The invention relates to apparatus for handling flowable material, particularly dry flowable material such as tablets.

It is often necessary to transfer tablets, for example in the pharmaceutical industry, from one station to another, particularly between stations at different levels.

In the past, gravity feed or pneumatic feed causes the tablets, which are often frangible, to become crushed or broken, which whilst leading to a loss of often expensive product, also can contaminate ambient atmosphere.

It is an object of the invention to seek to mitigate these disadvantages.

According to the invention there is provided apparatus for transferring flowable particulate material from one station to another, comprising a carrier for the material, and means externally of the carrier for moving the carrier between stations, the arrangement being such that the carrier and the means are not connected mechanically for movement of the carrier. Thus, damage to material being transferred is substantially avoided as there is no mechanical connection between the carrier and the means for moving it.

Suitably, the carrier may comprise magnetic properties and the external movement means may comprise a magnet. It will be understood that as used herein the term magnet may mean a permanent magnet or an electro magnet.

The carrier may be mounted in a housing, such as a tubular housing externally of which the moving means is mounted.

Apparatus embodying the invention is hereinafter described, by way of example, with reference to the accompanying drawings.

Fig. 1 shows a schematic side elevation of apparatus according to the invention;

Fig. 1A shows an elevational view of a part of the apparatus of Fig. 1; and

Fig. 1B shows a schematic plan view of a further part of the apparatus.

Referring to the drawings, there is shown apparatus 1 for transferring flowable particulate material such as dry tablets (not shown) for example pharmateutical tablets, from one station 2 to another 3. The apparatus 1 comprises a carrier 4 for the tablets, and means 5 externally of the carrier 4 for moving the carrier 4 between stations 2 and 3, the arrangement being such that the carrier 4 and the means 5 are not connected mechanically for movement of the carrier 4.

The apparatus 1 is shown mounted to transfer the tablets from an upper station 2 to a lower station 3, though it will be understood that a reverse transfer may be carried out. The carrier 4 for the tablets has magnetic properties, for example by having a body made of a metal with magnetic

properties, or by the body 6 being made of a non-magnetic material such as a plastic, with an insert 7 with magnetic properties. The carrier 4 is mounted for movement in a non-magnetic housing such as a tube 8, which has an entry port or funnel 9 at the upper station 2 by which the carrier may be topped up, and an outlet nozzle 10 at the lower station 3. The means 5 for moving the carrier 4 along the tube 8 comprises in the embodiment a magnet 11 which is externally positioned with respect to the carrier 4 and the tube 8 so that when moved in the direction of the length of the tube 8, the carrier 4 is moved along the tube, thereby gently to transfer the carrier 4, and tablets therein, between the upper and lower stations 2 and 3. The carrier 4 and tablets are moved gently as there is no mechanical connection between the magnet 11 forming the moving means 5 and the carrier 4. The magnet 11 moving means may be mounted along the tube by any suitable means, for example by motor, a screw, or other means, and the magnet may have a shape which fits round the external body 8 of the tube, which acts as a guide therefor, Fig. 1B.

There may be a sensor 12 to monitor and/or control tablet flow, and a stop 13 to provide for optimum positioning of the carrier 4 for tablet release through the nozzle 10 at the station 2.

Apparatus 1 as shown in the drawings may have the following feature:-

A device for raising or lowering components, particulates, tablets or other dry, flowable material (the product) from one level to another.

The product is transferred by a (possibly metal or plastic with metal insert) carrier, which travels inside a hollow tube, which runs from the point of product entry to product exit.

Suitable product entry and product exit ports are provided on the tube.

The carrier is constructed from a metal with magnetic properties or a plastic with such a metal insert.

The materials of construction of the tube allow an externally mounted magnet to act through the wall of the tube and hold the carrier in place.

The carrier is free of any mechanical connections. It is held in place exclusively by the external magnet.

By moving the position of the magnet along the external wall of the tube, the carrier is also moved up and down inside the tube as required.

The tube may be installed vertically or inclined as necessary to suit the facility design.

The exact position and speed of movement of the magnet/carrier is fully controllable to ensure gentle handling of the product.

The position of product within the tube can be directly determined by external sensors, which also act through the wall of the tube.

The internal (product contact surfaces and the carrier) can be fully cleaned in place automatically with liquid, for which there is a drain 14.

There may be a handle 15 of the carrier 4 for ease of removal from the tube, as by "twist and pull".

CLAIMS:

1. Apparatus for transferring flowable particulate material from one station to another, comprising a carrier for the material, and means externally of the carrier for moving the carrier between stations, the arrangement being such that the carrier and the means are not connected mechanically for movement of the carrier.

2. Apparatus according to claim 1, the carrier comprising magnetic properties and the external movement means comprising a magnet may comprise a magnet.

3. Apparatus according to claim 1 or claim 2, the carrier being mounted in a housing.

4. Apparatus according to claim 3, the housing providing a guide for guiding the travel of the carrier.

5. Apparatus according to claim 3, the housing providing the guide for guiding travel of the movement means.

6. Apparatus according to claim 3 or claim 4, the housing comprising a tube externally of which the moving means is mounted.

7. Apparatus according to claim 6, including sensors disposed about the tube for determining the position of the carrier therein.

8. Apparatus according to any preceding claim adapted for passing fluid into the housing for cleaning the internal surfaces thereof.

9. Apparatus according to claim 8 wherein the fluid is a liquid.

10. Apparatus according to claim 8 wherein the fluid is a gas.

11. Apparatus substantially as hereinbefore described with reference to the accompanying drawings.

12. Material handling apparatus comprising a first station and a second station and apparatus according to any preceding claim for transferring flowable particulate material from the one station to the other.

13. A method for transferring flowable particulate material from one station to another comprising the use of apparatus according to any of claims 1 to 12.

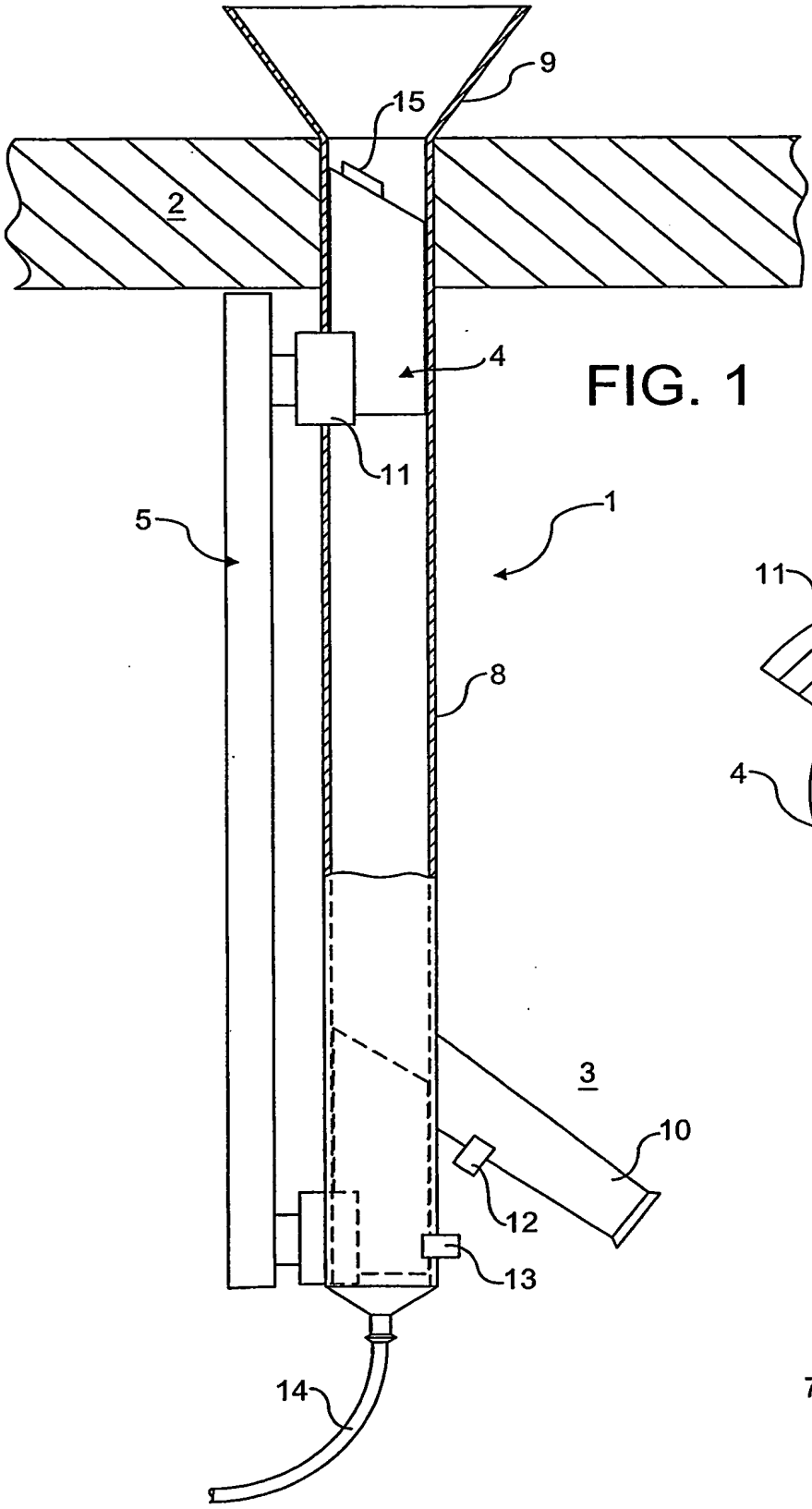

FIG. 1

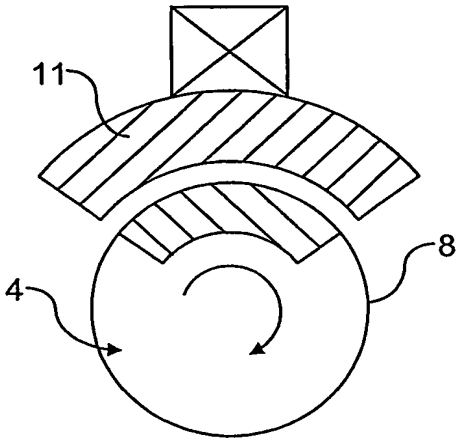

FIG. 1A

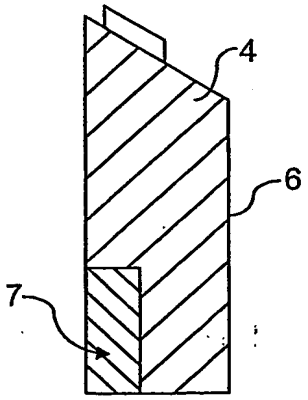

FIG. 1B

INTERNATIONAL SEARCH REPORT

Interna application No
PCT/ -3/00986

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B65G54/02 B65G69/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 727 366 A (ORANIENBURGER PHARMAWERK GMBH) 21 August 1996 (1996-08-21) column 3, line 19 - line 42; figure 2	1,3,4,6, 8,10,12, 13
X	EP 0 422 261 A (FRISCO FINDUS AG) 17 April 1991 (1991-04-17) column 2, line 31 -column 3, line 13; figure 1	1-6,12, 13
X	EP 0 376 668 A (MATSUI MFG CO ;KYOWA HAKKO KOGYO KK (JP)) 4 July 1990 (1990-07-04) column 6, line 7 - line 56; figures 1,2A,3	1,3,4, 6-8,10, 12,13

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 July 2003	09/07/2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Schneider, M

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Int al application No.
.../GB 03/00986

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 11
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 11

Rule 6.2(a) PCT

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

INTERNATIONAL SEARCH REPORT

Interna pplication No
PCT, 3/00986

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